

What is claimed is:

1. A method of stimulating a subterranean formation comprising the steps of:
 - (a) preparing a permeable cement composition comprising a hydraulic cement, water, and a degradable material capable of undergoing an irreversible degradation downhole;
 - (b) injecting the permeable cement composition prepared in step (a) into the subterranean formation at a pressure sufficient to create a fracture in the subterranean formation; and
 - (c) allowing the permeable cement composition to form a proppant matrix having voids in the fracture.
2. The method of claim 1 wherein the permeable cement composition further comprises a surfactant present in an amount sufficient to disperse the hydraulic cement and the degradable material within the permeable cement composition.
3. The method of claim 2 wherein the surfactant is present in the permeable cement composition in an amount ranging from about 0.1% to about 5% by weight of the permeable cement composition.
4. The method of claim 1 wherein the hydraulic cement comprises calcium, aluminum, silicon, oxygen, or sulfur.
5. The method of claim 1 wherein the hydraulic cement comprises a Portland cement, pozzolanic cement, gypsum cement, high alumina content cement, silica cement, high alkalinity cement, or low-density cement.
6. The method of claim 1 wherein the hydraulic cement is present in the permeable cement composition in an amount ranging from about 20% to about 70% by weight of the permeable cement composition.
7. The method of claim 1 wherein the water is present in an amount sufficient to make the permeable cement composition a pumpable slurry.
8. The method of claim 1 wherein the water comprises fresh water, salt water, or brine.
9. The method of claim 1 wherein the water is present in an amount ranging from about 15% to about 40% by weight of the permeable cement composition.

10. The method of claim 1 wherein the permeable cement composition further comprises a fluid loss additive.

11. The method of claim 10 wherein the fluid loss additive is present in the permeable cement composition in an amount ranging from about 0.1% to about 25% by weight of the permeable cement composition.

12. The method of claim 1 wherein the permeable cement composition is mixed on-the-fly.

13. The method of claim 1 further comprising before step (a) blending the permeable cement composition and transporting the permeable cement composition to the well site.

14. The method of claim 1 wherein the degradable material comprises a degradable polymer or a dehydrated salt.

15. The method of claim 14 wherein the degradable polymer comprises polysaccharides, chitins, chitosans, proteins, aliphatic polyesters, poly(lactides), poly(glycolides), poly(ϵ -caprolactones), poly(hydroxybutyrates), polyanhydrides, aliphatic polycarbonates, poly(orthoesters), poly(amino acids); poly(ethylene oxides), or polyphosphazenes.

16. The method of claim 1 wherein the degradable material further comprises a plasticizer.

17. The method of claim 14 wherein the dehydrated salt comprises anhydrous sodium tetraborate or anhydrous boric acid.

18. The method of claim 1 wherein the degradable material comprises a stereoisomer of a poly(lactide).

19. The method of claim 1 wherein the degradable material is present in an amount ranging from about 5% to about 70% by weight of the composition.

20. The method of claim 1 wherein the degradable material comprises particles having a rod-like shape.

21. The method of claim 1 wherein the voids comprise channel-like voids.

22. The method of claim 1 wherein the cement is a Portland cement present in an amount of from about 20% to about 70% by weight of the permeable

cement composition; the water is fresh water present in an amount of from about 15% to about 40% by weight of the cement composition; and the degradable material is a poly(lactic acid) particulate present in an amount of from about 5% to about 70% by weight of the permeable cement composition.

23. The method of claim 1 wherein the permeable cement composition further comprises proppant particles.

24. The method of claim 1 wherein the permeable cement proppant matrix has a permeability ranging from about 1 to about 125 darcies.

25. A method of maintaining the integrity of a fracture in a subterranean formation comprising the steps of:

(a) placing a permeable cement composition comprising a hydraulic cement, water, and a degradable material capable of undergoing an irreversible degradation downhole, and

(b) allowing the permeable cement composition to form a permeable cement proppant matrix in the fracture.

26. The method of claim 25 wherein the permeable cement composition further comprises a surfactant present in an amount sufficient to disperse the hydraulic cement and the degradable material within the permeable cement composition.

27. The method of claim 26 wherein the surfactant is present in the permeable cement composition in an amount ranging from about 0.1% to about 5% by weight of the permeable cement composition.

28. The method of claim 25 wherein the hydraulic cement comprises calcium, aluminum, silicon, oxygen, or sulfur.

29. The method of claim 25 wherein the hydraulic cement comprises a Portland cement, pozzolanic cement, gypsum cement, high alumina content cement, silica cement, high alkalinity cement, or low-density cement.

30. The method of claim 25 wherein the hydraulic cement is present in the permeable cement composition in an amount ranging from about 20% to about 70% by weight of the permeable cement composition.

31. The method of claim 25 wherein the water is present in an amount sufficient to make the permeable cement composition a pumpable slurry.

32. The method of claim 25 wherein the water comprises fresh water, salt water, or brine.

33. The method of claim 25 wherein the water is present in an amount ranging from about 15% to about 40% by weight of the permeable cement composition.

34. The method of claim 25 wherein the permeable cement composition further comprises a fluid loss additive.

35. The method of claim 34 wherein the fluid loss additive is present in the permeable cement composition in an amount ranging from about 0.1% to about 25% by weight of the permeable cement composition.

36. The method of claim 25 wherein the permeable cement composition is mixed on-the-fly.

37. The method of claim 25 further comprising before step (a) blending the permeable cement composition and transporting the permeable cement composition to the well site.

38. The method of claim 25 wherein the degradable material comprises a degradable polymer or a dehydrated salt.

39. The method of claim 38 wherein the degradable polymer comprises polysaccharides, chitins, chitosans, proteins, aliphatic polyesters, poly(lactides), poly(glycolides), poly(ϵ -caprolactones), poly(hydroxybutyrates), polyanhydrides, aliphatic polycarbonates, poly(orthoesters), poly(amino acids); poly(ethylene oxides), or polyphosphazenes.

40. The method of claim 25 wherein the degradable material further comprises a plasticizer.

41. The method of claim 38 wherein the dehydrated salt comprises anhydrous sodium tetraborate or anhydrous boric acid.

42. The method of claim 25 wherein the degradable material comprises a stereoisomer of a poly(lactide).

43. The method of claim 25 wherein the degradable material is present in an amount ranging from about 5% to about 70% by weight of the composition.

44. The method of claim 25 wherein the degradable material comprises particles having a rod-like shape.

45. The method of claim 25 wherein the cement is a Portland cement present in an amount of from about 20% to about 70% by weight of the permeable cement composition; the water is fresh water present in an amount of from about 15% to about 40% by weight of the cement composition; the degradable material is a poly(lactic acid) particulate present in an amount of from about 5% to about 70% by weight of the permeable cement composition; and wherein the permeable cement composition further

comprises a surfactant, present in an amount of from about 0.1% to about 5% by weight of the cement composition.

46. The method of claim 21 wherein the permeable cement proppant matrix has a permeability ranging from about 1 to about 125 darcies.

47. A method of forming a permeable cement proppant matrix in a fracture in a subterranean formation comprising the steps of:

- (a) placing a permeable cement composition comprising a hydraulic cement, water, and a degradable material capable of undergoing an irreversible degradation downhole in the fracture, and
- (b) allowing the permeable cement composition to form a permeable cement proppant matrix in the fracture.

48. The method of claim 47 wherein the permeable cement composition further comprises a surfactant present in an amount sufficient to disperse the hydraulic cement and the degradable material within the permeable cement composition.

49. The method of claim 48 wherein the surfactant is present in the permeable cement composition in an amount ranging from about 0.1% to about 5% by weight of the permeable cement composition.

50. The method of claim 47 wherein the hydraulic cement comprises calcium, aluminum, silicon, oxygen, or sulfur.

51. The method of claim 47 wherein the hydraulic cement comprises a Portland cement, pozzolanic cement, gypsum cement, high alumina content cement, silica cement, high alkalinity cement, or low-density cement.

52. The method of claim 47 wherein the hydraulic cement is present in the permeable cement composition in an amount ranging from about 20% to about 70% by weight of the permeable cement composition.

53. The method of claim 47 wherein the water is present in an amount sufficient to make the permeable cement composition a pumpable slurry.

54. The method of claim 47 wherein the water comprises fresh water, salt water, or brine.

55. The method of claim 47 wherein the water is present in an amount ranging from about 15% to about 40% by weight of the permeable cement composition.

56. The method of claim 47 wherein the permeable cement composition further comprises a fluid loss additive.

57. The method of claim 56 wherein the fluid loss additive is present in the permeable cement composition in an amount ranging from about 0.1% to about 25% by weight of the permeable cement composition.

58. The method of claim 47 wherein the permeable cement composition is mixed on-the-fly.

59. The method of claim 47 further comprising before step (a) blending the permeable cement composition and transporting the permeable cement composition to the well site.

60. The method of claim 47 wherein the degradable material comprises a degradable polymer or a dehydrated salt.

61. The method of claim 60 wherein the degradable polymer comprises polysaccharides, chitins, chitosans, proteins, aliphatic polyesters, poly(lactides), poly(glycolides), poly(ϵ -caprolactones), poly(hydroxybutyrates), polyanhydrides, aliphatic polycarbonates, poly(orthoesters), poly(amino acids); poly(ethylene oxides), or polyphosphazenes.

62. The method of claim 47 wherein the degradable material further comprises a plasticizer.

63. The method of claim 60 wherein the dehydrated salt comprises anhydrous sodium tetraborate or anhydrous boric acid.

64. The method of claim 47 wherein the degradable material comprises a stereoisomer of a poly(lactide).

65. The method of claim 47 wherein the degradable material is present in an amount ranging from about 5% to about 70% by weight of the composition.

66. The method of claim 47 wherein the degradable material comprises particles having a rod-like shape.

67. The method of claim 47 wherein the cement is a Portland cement present in an amount of from about 20% to about 70% by weight of the permeable cement composition; the water is fresh water present in an amount of from about 15% to about 40% by weight of the cement composition; the degradable material is a poly(lactic acid) particulate present in an amount of from about 5% to about 70% by weight of the permeable cement composition; and wherein the permeable cement composition further

comprises a surfactant, present in an amount of from about 0.1% to about 5% by weight of the cement composition.

68. The method of claim 47 wherein the permeable cement proppant matrix has a permeability ranging from about 1 to about 125 darcies.

69. A fracturing fluid comprising a permeable cement composition that comprises a hydraulic cement, water, and a degradable material capable of undergoing an irreversible degradation downhole.

70. The composition of claim 69 wherein the permeable cement composition further comprises a surfactant present in an amount sufficient to disperse the hydraulic cement and the degradable material within the permeable cement composition.

71. The composition of claim 70 wherein the surfactant is present in the permeable cement composition in an amount ranging from about 0.1% to about 5% by weight of the permeable cement composition.

72. The composition of claim 69 wherein the hydraulic cement comprises calcium, aluminum, silicon, oxygen, or sulfur.

73. The composition of claim 69 wherein the hydraulic cement comprises a Portland cement, pozzolanic cement, gypsum cement, high alumina content cement, silica cement, high alkalinity cement, or low-density cement.

74. The composition of claim 69 wherein the hydraulic cement is present in the permeable cement composition in an amount ranging from about 20% to about 70% by weight of the permeable cement composition.

75. The composition of claim 69 wherein the water is present in an amount sufficient to make the permeable cement composition a pumpable slurry.

76. The composition of claim 69 wherein the water comprises fresh water, salt water, or brine.

77. The composition of claim 69 wherein the water is present in an amount ranging from about 15% to about 35% by weight of the permeable cement composition.

78. The composition of claim 69 wherein the permeable cement composition further comprises a fluid loss additive.

79. The composition of claim 78 wherein the fluid loss additive is present in the permeable cement composition in an amount ranging from about 0.1% to about 25% by weight of the permeable cement composition.

80. The composition of claim 69 wherein the permeable cement composition is mixed on-the-fly.

81. The composition of claim 69 wherein the degradable material comprises a degradable polymer or a dehydrated salt.

82. The composition of claim 81 wherein the degradable polymer comprises polysaccharides, chitins, chitosans, proteins, aliphatic polyesters, poly(lactides), poly(glycolides), poly(ϵ -caprolactones), poly(hydroxybutyrates), polyanhydrides, aliphatic polycarbonates, poly(orthoesters), poly(amino acids); poly(ethylene oxides), or polyphosphazenes.

83. The composition of claim 69 wherein the degradable material further comprises a plasticizer.

84. The composition of claim 81 wherein the dehydrated salt comprises anhydrous sodium tetraborate or anhydrous boric acid.

85. The composition of claim 69 wherein the degradable material comprises a stereoisomer of a poly(lactide).

86. The composition of claim 69 wherein the degradable material is present in an amount ranging from about 5% to about 70% by weight of the composition.

87. The composition of claim 69 wherein the degradable material comprises particles having a rod-like shape.

88. The composition of claim 69 wherein the cement is a Portland cement present in an amount of from about 20% to about 70% by weight of the permeable cement composition; the water is fresh water present in an amount of from about 15% to about 40% by weight of the cement composition; and the degradable material is a poly(lactic acid) particulate present in an amount of from about 5% to about 70% by weight of the permeable cement composition.

89. The composition of claim 69 wherein the permeable cement composition further comprises a proppant material.

90. The composition of claim 89 wherein the proppant material is a sand, walnut shells, ceramic, or polymeric material.

91. A permeable cement composition comprising a hydraulic cement, water, and a degradable material capable of undergoing an irreversible degradation downhole.

92. The composition of claim 91 wherein the permeable cement composition further comprises a surfactant present in an amount sufficient to disperse the hydraulic cement and the degradable material within the permeable cement composition.

93. The composition of claim 91 wherein the hydraulic cement comprises calcium, aluminum, silicon, oxygen, or sulfur.

94. The composition of claim 91 wherein the hydraulic cement comprises a Portland cement, pozzolanic cement, gypsum cement, high alumina content cement, silica cement, high alkalinity cement, or low-density cement.

95. The composition of claim 91 wherein the hydraulic cement is present in the permeable cement composition in an amount ranging from about 20% to about 70% by weight of the permeable cement composition.

96. The composition of claim 91 wherein the water is present in an amount sufficient to make the permeable cement composition a pumpable slurry.

97. The composition of claim 91 wherein the water comprises fresh water, salt water, or brine.

98. The composition of claim 91 wherein the permeable cement composition further comprises a fluid loss additive.

99. The composition of claim 91 wherein the permeable cement composition is mixed on-the-fly.

100. The composition of claim 91 wherein the degradable material comprises a degradable polymer or a dehydrated salt.

101. The composition of claim 100 wherein the degradable polymer comprises polysaccharides, chitins, chitosans, proteins, aliphatic polyesters, poly(lactides), poly(glycolides), poly(ϵ -caprolactones), poly(hydroxybutyrates), polyanhydrides, aliphatic polycarbonates, poly(orthoesters), poly(amino acids); poly(ethylene oxides), or polyphosphazenes.

102. The composition of claim 91 wherein the degradable material further comprises a plasticizer.

103. The composition of claim 100 wherein the dehydrated salt comprises anhydrous sodium tetraborate or anhydrous boric acid.

104. The composition of claim 91 wherein the degradable material comprises a stereoisomer of a poly(lactide).

105. The composition of claim 91 wherein the degradable material is present in an amount ranging from about 5% to about 70% by weight of the composition.

106. The composition of claim 91 wherein the degradable material comprises particles having a rod-like shape.

107. The composition of claim 91 wherein the cement is a Portland cement present in an amount of from about 20% to about 70% by weight of the permeable cement composition; the water is fresh water present in an amount of from about 15% to about 40% by weight of the cement composition; and the degradable material is a poly(lactic acid) particulate present in an amount of from about 5% to about 70% by weight of the permeable cement composition.

108. The composition of claim 91 wherein the permeable cement composition further comprises a proppant material.

109. The composition of claim 108 wherein the proppant material is a sand, walnut shells, ceramic, or polymeric material.